

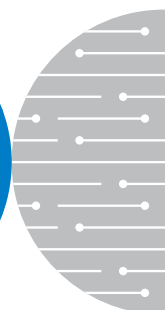


Why Embedded Intel® Architecture in Communications?

Intel in
Communications



run
Better, faster
and further.



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Executive Summary

The communications industry is experiencing a rapid evolution, driven by pervasive trends that include the convergence of voice and data, the availability of bandwidth required to carry richer data types and the trend towards greater in-network data processing. These market dynamics create new challenges for equipment developers and network operators alike. Additionally, OEMs face the challenge of implementing scalable design solutions that can meet a wide variety of performance requirements, yet today's increasingly competitive market dynamics dictate that these solutions must be flexible enough to meet tight time-to-market demands. Finally, service providers are looking for ways to cost-effectively deploy new communications capabilities into existing network infrastructures.

Intel is committed to serving the communications industry through significant investments in new communications technologies that support the convergence of voice and data in the network infrastructure. Intel also supports industry efforts to apply the proven scalability and fast time-to-market design environment enabled by Embedded Intel® Architecture (EIA). Using EIA building blocks, development tools, and reference platforms can help provide a valuable head start in the development of new products, while enabling value-added features and future upgrades to be added in software. Development can be further enhanced by the availability of a variety of EIA-based software, support for a wide range of standard and real-time operating systems, and board-level platform solutions currently available from Intel and third-party providers.

Trends Shaping Next-Generation Networks

Today's networks are rapidly evolving to support the next generation of services, influenced by these key trends:

- Greater network bandwidths, along with mobile telephony and wireless Internet capabilities, are creating the demand for new technologies that support higher traffic from the edge to the core, requiring equipment with higher port densities. In addition, higher traffic and complex network architectures are requiring a more robust, intelligent control plane, with improved processing capabilities.
- Converged network architectures that blend legacy circuit-switched and modern packet-routed operations require a new generation of more easily configurable network elements. The intersection of public and private networks is demanding that equipment manufacturers provide open standards-based equipment, capable of supporting multiple services.

- Developer focus is turning away from simple data transport and moving towards applications that filter, reformulate, and shape data.
- On the network edge, growth opportunities are being driven by the growing demand for digital loop carriers, optical network units, integrated access devices, routers and media gateways, cable modem termination systems, DSL access multiplexers, radio network controllers, and mobile switching centers.

Why Embedded Intel® Architecture?

EIA processors, chipsets, software initiatives, and other building blocks help provide the combination of performance, scalability, and software-based upgradeability needed to meet the growing requirements of next-generation networks at multiple levels of the OSI Application Services Layer. In addition, EIA processors provide the power to handle compute-intensive control operations, including services and functions required by the application services layer such as routing and signaling protocols, policy control, Quality of Service (QoS), and security. EIA reference designs for communications help provide the performance to support demanding telecom services and applications such as VoIP, telephony and billing services in second-generation and third-generation network appliances.

The Need for Performance

CPU and system-level performance have become increasingly important across a wide range of communications applications. Services and functions include network routing and switching, virtual private network and firewall security, web caching, and storage. Applications include policy management and policing, load balancing, VoIP gateways, and multi-function devices such as combination Web, news, and e-mail servers. As functions converge on a device, the processing demands increase in a nonlinear fashion since many applications must cycle in real-time. Applications are also rapidly becoming more complex because the combination of depth and breadth of data processing and throughput, rather than stand-alone features, are important factors in the competitive landscape.

EIA can help reduce time-to-market and promote software-based product differentiation in devices designed to function at several levels:

- In carrier core applications, EIA processors support services and applications for the network, including SS7, call processing, network management, and adjunct processing for computer/telephony integration. EIA provides scalable and high-performance processing, with time-to-market platform-based solutions available from a variety of third-party solutions providers.

- Specific applications within the network infrastructure include switches, routers, private branch exchanges, and blades.
- Access applications on the network edge include Web servers, and servers for voice, security, and storage.
- Enterprise equipment and dedicated communications appliances include products for Network Attached Storage (NAS), Web caching, firewalls, Virtual Private Networks (VPN), and Multi-Service Access Devices (MSAD).

Embedded Intel Architecture Components

To help developers meet application demands, Intel provides communications building blocks based on a range of platform options. Designed for embedded applications, these processors are available in multiple, scalable product lines that deliver performance, low power, and integration. They also provide the added flexibility of compact Flip-Chip Pin Grid Array (FC-PGA) and Ball Grid Array (FC-BGA) packaging. CPU performance is augmented by the extended I/O throughput and high concurrency of Intel® chipsets, memory, and I/O devices.

- **Intel® Pentium® M processors** meet the demands of high-performance, low-power embedded computing and are well suited for communications applications with thermally sensitive environments. Intel SpeedStep® technology allows the application to adjust processor frequency and input voltage real-time.
- **Intel® Pentium® 4 processors** provide performance headroom for devices with heavy application demands, with scalability that helps minimize total cost-of-ownership.
- **Intel® Xeon™ and Low Voltage Intel® Xeon™ processors** are the solution for specific communication applications that require the highest levels of processing performance. The Low Voltage Intel Xeon processor has the added benefit of lower thermal design power, making it ideal for environments that require high processing performance with low power. The Intel Xeon processor features Intel NetBurst® microarchitecture and hyper-threading technology.
- **Intel® Celeron® M processors** provide performance combined with low power and are applicable for communications appliances with lower power envelopes and BOM requirements.
- **Intel® E7501 chipset** supports dual-processor platforms for the Intel Xeon processor and the Low Voltage Intel Xeon processor. It also supports uni-processor platforms for the Intel Pentium M processor. The Intel E7501 chipset design delivers high system bus, memory, and I/O bandwidths to enhance performance and scalability while providing a smooth transition to next-generation technologies.

- **Intel® 875P chipset** supports the Intel Pentium 4 processor and maintains a balance of price and performance for embedded computing solutions. The Intel 875P chipset consists of the Intel® 82875P Memory Controller Hub (MCH) and the Intel® 6300ESB I/O Controller Hub (ICH). Together, they provide exceptional bandwidth and support the latest graphics controllers needed to meet the demands of today's embedded computing market segments.
- **Intel® 855GME chipset** with the Intel® FW82801DB I/O Controller Hub 4 (ICH-4) or the Intel 6300ESB ICH is validated with the Intel Pentium M processor in a high-performance, low-power platform that is well-suited for communications applications.

Development Tools

EIA also includes a comprehensive array of development tools for performance analysis, software development, and hardware integration. The easy programmability and code compatibility of EIA helps minimize time-to-market. Once system hardware has been deployed, vendors can add differentiating features through software modifications. This platform-based approach to development maximizes the time-in-market for a given hardware design, and enables developers to easily implement value-added and innovative features without expensive re-engineering. In addition, a software solution may be scaled across the offering of EIA platforms.

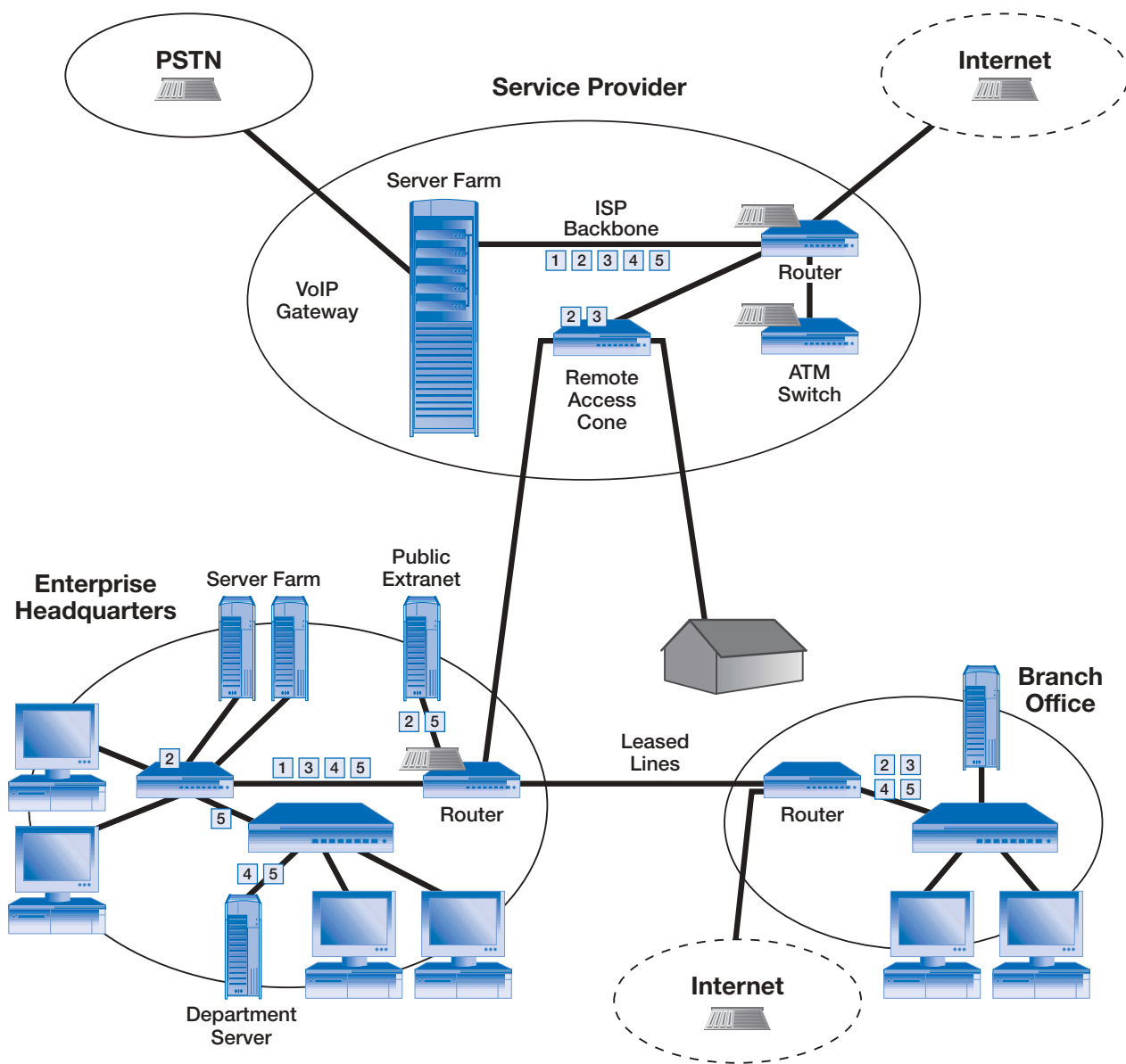
With its inherent designability, EIA helps enable developers to focus their available resources on developing software applications and value-added services that will help sustain their competitive advantage. Other important advantages for developers include:

- Support for a wide range of standard and real-time operating systems.
- Scalable reference designs for communications appliances and network infrastructure products.
- Embedded product life cycles to further maximize time-in-market with continuous, cost-effective product evolution.
- Low-profile packaging adapted to small form-factor communications devices.

Intel also offers the Embedded Software Suite (ESS), a unified set of components, tools, and software services utilized to accelerate the development of embedded IA-32 platforms. ESS reduces engineering cycle time and development costs by adopting, modifying, or creating software according to the functionality requirements of embedded developers.

Figure 1. Performance Throughout the Network Infrastructure.

EIA supports application processing throughout the network infrastructure.

**Infrastructure:**

Blades or Servers

Appliances:

- 1 Intrusion Detection
- 2 Firewall VPN
- 3 QoS, Bandwidth Management, SLM
- 4 Probe/Sniffer
- 5 Load Balancing

Conclusion: An Architecture with Many Advantages

Following is a summary of the advantages of EID for communications applications:

- **Accelerated Time-to-Market:** The Internet economy places a premium on rapid product development. EIA is familiar to design engineers worldwide, with optimized tools to help speed development, and reference designs that support fast product design and manufacturability.
- **Extended Time-in-Market:** Intel components support embedded product life cycles. Intel reference designs support a platform-based architecture that helps enable developers to update product functionality through software upgrades, extending the life of hardware designs.
- **High Performance:** Intel components provide the processing performance required by in-network applications that offer additional network services.
- **Scalability:** EIA supports scalable solutions in communications applications that serve a broad cross-section of market sub-segments, ranging from small/medium business at the low end, to enterprise and carrier-class at the high end.
- **Intel® Communications Alliance:** This membership-based program is composed of communications and embedded developers, and solution providers. The group is committed to providing a strategic supply line of standards-based solutions to the communications and embedded market segments through complementary hardware, software, and services.
- **High Availability:** Intel is working with OEMs on requirements for high-availability systems.
- **Intel Quality and Manufacturing Capacity:** With its high-volume manufacturing facilities and quality assurance programs, Intel is uniquely positioned to meet the growing needs of developers serving the communications market segment.

For more information, visit the Intel Web site at: developer.intel.com

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